

# Effects Of Shoreline Modification on Spawning Habitat of Surf Smelt (*Hypomesus pretiosus*) in Puget Sound, Washington

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## Abstract

Surf smelt (*Hypomesus pretiosus*) are an ecologically and recreationally important forage fish occurring throughout Puget Sound and spawns on gravel-sand beaches in the upper intertidal zone. Vegetated summer spawning beaches have been shown to have higher surf smelt embryo abundance and survival, presumably as a result of thermal stress caused by a lack of shading by vegetation. Shoreline armoring and vegetation removal are two of the most prevalent and severe anthropogenic disturbances in nearshore environments. This pilot study compares an armored, unvegetated beach with a natural, vegetated beach in terms of several physical environmental variables, total surf smelt embryo abundance, and live versus dead embryos. At a tidal height of approximately MLLW+12ft during the period of July 16-20, 2001, continuous electronic data loggers were installed on a natural beach and on an adjacent highly modified beach on the north shore of Camano Island, Washington. Data loggers recorded light intensity, humidity, and air and substrate temperature. At the end of the experimental period, five substrate samples were collected from the top 3-cm at each beach along 10-m transects parallel to shore at the site and elevation where the loggers were located. These substrate samples were preserved for later examination of surf smelt embryos. The modified, unvegetated beach had significantly lower mean relative humidity, and higher mean light intensity, air temperature, and substrate temperature. Particularly striking were differences in substrate temperature, which, on the natural beach, ranged from 12.1°C to 18.2°C with a mean of 14.°C, and on the modified beach ranged from 12.5°C to 29.4°C with a mean of 18.5°C. Although not significantly different statistically, the proportion of live embryos and total embryo abundance at the altered beach were approximately half that of the natural beach. Expanded, systematic field studies combined with controlled laboratory experiments could build on this and historical information to evaluate the effects of altered shoreline habitats on surf smelt spawning habitat.